

We claim:

1. A process for making dispersable surfactant capped nanocrystals of metal oxides which comprises : (a) mixing a solution of a metal cupferron precursor complex of the formula $M^X\text{Cup}_X$, wherein M^X is a metal ion in the oxidation state X selected from the group consisting of elements in Group 2, Group 3 – 12 of the 4th period, Group 3 – 6 of the 5th and 6th period, Group 10 – 12 of the 5th period, Group 12 of the 6th period, and Group 13th to 15th, and the Lanthanide and Actinide series of the periodic table, and Cup is a N-substituted N-nitroso hydroxylamine, with a coordinating surfactant , and (b) heating the mixture at a temperature and for a sufficient period of time to cause thermal decomposition of the $M^X\text{Cup}_X$ precursor and formation of the desired nanocrystals.
2. The process of Claim 1 wherein said the reaction is conducted in an inert atmosphere.
3. The process of Claim 2 wherein said inert atmosphere is argon or nitrogen gas.
4. The process of Claim 1 wherein said reaction is conducted in the absence of water, air or oxygen.
5. The process of Claim 1 wherein the mixture is heated to or maintained at a temperature ranging from about 150 °C to about 400 °C.
6. The process of Claim 1 wherein M is Fe .
7. The process of Claim 1 wherein M is Mn .
8. The process of Claim 1 wherein M is Cu .

9. The process of Claim 1 wherein said coordinating surfactant is an organic molecule consisting of a polar headgroup and an apolar group providing stabilization against coagulation and precipitation of particles.

10. The process of Claim 9 wherein said coordinating surfactant is hexadecylamine or trioctylamine.

11. The process of Claim 1 wherein said N-substituted N-nitroso hydroxylamine is N-nitroso-N-phenyl hydroxylamine (Cupferron).

12. The process of Claim 1 wherein M is Fe, Cup is N-nitroso-N-phenyl hydroxylamine, and the coordinating surfactant is hexadecylamine.

13. A process for making dispersable surfactant capped nanocrystals of metal oxides with non-hydroxylated particle surfaces which comprises mixing a solution of a metal cupferron complex of the formula $M^X\text{Cup}_x$, wherein M^X is a metal ion in the oxidation state X selected from the group consisting of elements in Group 2, Group 3 – 12 of the 4th period, Group 3 – 6 of the 5th and 6th period, Group 10 – 12 of the 5th period, Group 12 of the 6th period, and Group 13th to 15th, and the Lanthanide and Actinide series of the periodic table, and Cup is cupferron, into an amine based coordinating surfactant, at a temperature ranging from about 250 °C to about 300 °C, and allowing the reaction to proceed for a period of time sufficient to cause thermal decomposition of said $M^X\text{Cup}_x$, and formation of the desired nanocrystals.

14. A surfactant capped nanocrystal made in accordance with the process of Claim 1.

15. A process for making dispersable surfactant capped nanocrystals of transition metal oxides with non-hydroxylated particle surfaces which comprises injecting a

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16. A process for making surfactant capped nanocrystals of transition metal oxides which comprises injecting a solution of a metal cupferron complex of the formula $M^x\text{Cup}_x$, wherein M is selected from the group consisting of Fe, Mn, and Cu, and Cup is N-nitroso-N-phenyl hydroxylamine, into an amine based coordinating surfactant, the injection reaction being conducted at a temperature ranging from about 150 °C to about 400 °C, for a period of time sufficient to complete the reaction.

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